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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/597,739	SADRI ET AL.	
	Examiner	Art Unit	
	ADNAN BAIG	2416	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *2/17/2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-5,7 and 9-17* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5,7 and 9-17* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed 2/17/2009 have been fully considered but they are not persuasive for the following reasons:

In regards to applicant's arguments to 103 rejection of cancelled claim 8 with regards to incorporation of its subject matter in amended claims 1, 7, 11 and 15, the reference of record discloses all elements of

"*filtering a plurality of data streams received over a channel for a multiple input multiple output system to reduce far end cross talk between said data streams using said crosstalk suppression filter matrix* (**see Fig. 1 item 170)** *to form filtered data streams* **([0007] see Lines 13-18)**

said filtered data streams having substantially similar equal impulse responses, **(Referring to Fig. 1, Ketchum illustrates a plurality of data streams by vector r(n) [0031], where r(n) is filtered through filter 172. Ketchum teaches a corresponding equal matched filter for each individual set of plurality data streams which outputs equal impulse responses for each data stream that is filtered, [0040-0043]).**

equalizing said filtered data streams **([0007] see lines 7-15)** *using one or more equalizers with a set of substantially similar equalization parameters*." **(Referring to Fig. 6A and 6B,Ketchum illustrates one or more equalizers where the plurality of**

data streams r(n) are filtered and equalized and forwarded to decision feedback filter 618 to form recover data streams), [0136].

(Referring to 5, Ketchum illustrates one or more equalizers where a channel impulse response matrix containing the impulse responses of said data streams is generated from channel estimator 512 and forwarded to equalizer 522).

(Referring to Fig. 1, Ketchum illustrates using distortion estimates as equalization parameters, see [0038] lines 1-11 & [0034]).

The reference of record discloses all elements of amended claims 1, 5, 7 and 9-17.

estimating a channel impulse response matrix, **(see Lines 1-5 of [0080] & [0081])**

creating a crosstalk suppression filter matrix based on said channel impulse response matrix, (**[0007] see Lines 3-11 and Fig. 1 which illustrates the impulse response for the received symbol vector r(n) wherein a noise vector Z(n) is processed at the receiver, and is transmitted through a suppression filter 170).**

filtering a plurality of data streams received over a channel for a multiple input multiple output system to reduce far end cross talk between said data streams using said crosstalk suppression filter matrix (**see Fig. 1 item 170**) to form filtered data streams, **([0007] see Lines 13-18).**

said filtered data streams having substantially similar equal impulse responses,

(Referring to Fig. 1, Ketchum illustrates a plurality of data streams by vector r(n) [0031], where r(n) is filtered through filter 172. Ketchum teaches a corresponding equal matched filter for each individual set of plurality data streams which

outputs equal impulse responses for each data stream that is filtered, [0040-0043]).

equalizing said filtered data streams **([0007] see lines 7-15)**

using one or more equalizers with a set of substantially similar equalization parameters, **(Referring to Fig. 6A and 6B,Ketchum illustrates one or more equalizers where the plurality of data streams r(n) are filtered and equalized and forwarded to decision feedback filter 618 to form recover data streams), [0136].**

(Referring to 5, Ketchum illustrates one or more equalizers where a channel impulse response matrix containing the impulse responses of said data streams is generated from channel estimator 512 and forwarded to equalizer 522).

(Referring to Fig. 1, Ketchum illustrates using distortion estimates as equalization parameters, see [0038] lines 1-11 & [0034]).

In regards to applicant's arguments to 103 rejection of cancelled claim 8, the reference of record does teach the use of one or more equalizers. **(Referring to Fig. 6A and 6B,Ketchum illustrates one or more equalizers where the plurality of data streams r(n) are filtered and equalized and forwarded to decision feedback filter 618 to form recover data streams), [0136].**

(Referring to 5, Ketchum illustrates one or more equalizers where a channel impulse response matrix containing the impulse responses of said data streams is generated from channel estimator 512 and forwarded to equalizer 522).

In regards to amended claims 1,7,11, and 15, Ketchum does disclose all the elements further amended to recite "*filtering a plurality of data streams received over a channel for a multiple input multiple output system to reduce far end cross talk between said data streams using said crosstalk suppression filter matrix* (**see Fig. 1 item 170**) *to form filtered data streams*, **([0007] see Lines 13-18),** *said filtered data streams having substantially similar equal impulse responses*" **(Referring to Fig. 1, Ketchum illustrates a plurality of data streams by vector r(n) [0031], where r(n) is filtered through filter 172. Ketchum teaches a corresponding equal matched filter for each individual set of plurality data streams which outputs equal impulse responses for each data stream that is filtered, [0040-0043]).**

In regards to applicant's remarks concerning claims 2-5, 9, 10, 12-14, 16, and 17, the reference of record teaches all the elements of amended claims 1, 7, 11, and 15. estimating a channel impulse response matrix, **(see Lines 1-5 of [0080] & [0081])** creating a crosstalk suppression filter matrix (**see Fig. 1 item 170**) based on said channel impulse response matrix, (**[0007] see Lines 3-11 and Fig. 1 which illustrates the impulse response for the received symbol vector r(n) wherein a noise vector Z(n) is processed at the receiver, and is transmitted through a suppression filter).** filtering a plurality of data streams received over a channel for a multiple input multiple output system to reduce far end cross talk between said data streams using said crosstalk suppression filter matrix (**see Fig. 1 item 170**) to form filtered data streams, **([0007] see Lines 13-18).**

said filtered data streams having substantially similar equal impulse responses,

(Referring to Fig. 1, Ketchum illustrates a plurality of data streams by vector r(n) [0031], where r(n) is filtered through filter 172. Ketchum teaches a corresponding equal matched filter for each individual set of plurality data streams which outputs equal impulse responses for each data stream that is filtered, [0040-0043]).

equalizing said filtered data streams **([0007] see lines 7-15)**

using one or more equalizers with a set of substantially similar equalization parameters,

[0034] (Referring to Fig. 6A and 6B,Ketchum illustrates one or more equalizers where the plurality of data streams r(n) are filtered and equalized and forwarded to decision feedback filter 618 to form recover data streams), [0136].

(Referring to 5, Ketchum illustrates one or more equalizers where a channel impulse response matrix containing the impulse responses of said data streams is generated from channel estimator 512 and forwarded to equalizer 522).

(Referring to Fig. 1, Ketchum illustrates using distortion estimates as equalization parameters, see [0038] lines 1-11 & [0034]).

In regards to applicants remarks concerning claims 1-5, 7 and 9-17 the Ketchum reference does teach one or more equalizers and their associated parameters,

(Referring to Fig. 6A and 6B,Ketchum illustrates one or more equalizers where the plurality of data streams r(n) are filtered and equalized and forwarded to decision feedback filter 618 to form recover data streams), [0136].

(Referring to 5, Ketchum illustrates one or more equalizers where a channel impulse response matrix containing the impulse responses of said data streams is generated from channel estimator 512 and forwarded to equalizer 522).

(Referring to Fig. 1, Ketchum illustrates using distortion estimates as equalization parameters, see [0038] lines 1-11 & [0034]).

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-5, 7 and 9-17 are rejected under 35 U.S.C. 102(b) as being anticipated by Ketchum (of record).

Regarding Claim 1, Ketchum discloses a method, comprising:

estimating a channel impulse response matrix, **(see Lines 1-5 of [0080] & [0081])**

creating a crosstalk suppression filter matrix based on said channel impulse response matrix, (**[0007] see Lines 3-11 and Fig. 1 which illustrates the impulse response for the received symbol vector r(n) wherein a noise vector Z(n) is processed at the receiver, and is transmitted through a suppression filter 170).**

filtering a plurality of data streams received over a channel for a multiple input multiple

output system to reduce far end cross talk between said data streams using said crosstalk suppression filter matrix (**see Fig. 1 item 170**) to form filtered data streams, **([0007] see Lines 13-18).**

said filtered data streams having substantially similar equal impulse responses, **(Referring to Fig. 1, Ketchum illustrates a plurality of data streams by vector r(n) [0031], where r(n) is filtered through filter 172. Ketchum teaches a corresponding equal matched filter for each individual set of plurality data streams which outputs equal impulse responses for each data stream that is filtered, [0040-0043]).**

equalizing said filtered data streams **([0007] see lines 7-15)**
using one or more equalizers with a set of substantially similar equalization parameters, **(Referring to Fig. 6A and 6B,Ketchum illustrates one or more equalizers where the plurality of data streams r(n) are filtered and equalized and forwarded to decision feedback filter 618 to form recover data streams), [0136].**
(Referring to 5, Ketchum illustrates one or more equalizers where a channel impulse response matrix containing the impulse responses of said data streams is generated from channel estimator 512 and forwarded to equalizer 522).
(Referring to Fig. 1, Ketchum illustrates using distortion estimates as equalization parameters, see [0038] lines 1-11 & [0034]).

Regarding Claim 2, Ketchum discloses method of claim 1, wherein said channel impulse response matrix and said crosstalk suppression filter matrix have a substantially similar structure and matrix dimension,**[0042] see lines 1-7 (Ketchum describes the filter as in claim 1, matched to the impulse response in the equivalent channel).**
(In paragraph [0044] Ketchum discloses a formula that shows that the matrices of said channel impulse response and suppression filter are equal. Paragraphs [0045-0048] discuss the properties of said channel impulse response and suppression filter).

Regarding Claim 3, Ketchum discloses the method of claim 1, wherein said estimating comprises:
estimating at least one channel characteristic for said channel**, ([0007] see Lines 1-7 Interpretation of the claim language with respect to applicant's specification shows the signals are predetermined for the response values at the receiving end. Ketchum discloses that a number of received signals or "response values" are preconditioned based on an estimated response of the MIMO channel which in return forms a channel impulse response matrix).**

(The signals communicated between the transmitter and receiver over the channel once the characteristic is measured, are shown to be predetermined by Ketchum, [0030]).

approximating a plurality of channel impulse response values based on said channel characteristic, **([0020]).**

creating said channel impulse response matrix using said channel impulse response values, **([0020-0022]).**

Regarding Claim 4, Ketchum discloses the method of claim 1, wherein said creating comprises:

transposing said channel impulse response matrix, **([0042])**

substituting each element of said transposed channel impulse response matrix with its minor element, **(Substituting each element of said CIR matrix with its minor element is interpreted as convolution in the claim with respect to the applicant's specification. The paragraph illustrates convolution being performed on said transposed channel impulse response matrix, [0114]).**

determining a sign for each minor element, **([0126] [0127 lines 1-5]. Determining a sign for each minor element is interpreted as convolution values in the claim with**

respect to the applicant's specifications. The paragraphs cited, determine the order for the convolution values or "minor element" based on the values sign).

Regarding Claim 5, Ketchum discloses the method of claim 1, wherein each data stream comprises an inter-symbol interference signal, **[0036]**

Regarding Claim 7, Ketchum discloses a multiple input multiple output system, comprising:

a communications medium; a plurality of transmitters to connect to said communications medium, with each transmitter to transmit a data stream over said communications medium using a communications channel, a plurality of receivers to connect to said communications medium, said plurality of receivers to receive said data streams from said communications channel, **[0007] (Ketchum illustrates a MIMO system in Fig. 3 where section 300 illustrates the plurality of transmitters and receivers connected to communications medium 310).**

a crosstalk filtering module to connect to said plurality of receivers, said crosstalk filtering module to filter said data streams to reduce far end crosstalk noise incurred by said data streams during said transmission to form filtered data streams **(Fig. 1 section 170 illustrates a crosstalk filtering module connected to the receivers of said MIMO system [0034] see Lines 1-9).**

said filtered data streams having substantially similar equal impulse responses; **(Referring to Fig. 1, Ketchum illustrates a plurality of data streams by vector r(n) [0031], where r(n) is filtered through filter 172. Ketchum teaches a corresponding equal matched filter for each individual set of plurality data streams which outputs equal impulse responses for each data stream that is filtered, [0040-0043]).**

one or more equalizers to connect to said crosstalk filtering module, said one or more equalizers to equalize said filtered data streams using a set of substantially similar equalization parameters, **(Referring to Fig. 6A and 6B, Ketchum illustrates one or more equalizers where the plurality of data streams r(n) are filtered and equalized and forwarded to decision feedback filter 618 to form recover data streams), [0136].**
(Referring to 5, Ketchum illustrates one or more equalizers where a channel impulse response matrix containing the impulse responses of said data streams is generated from channel estimator 512 and forwarded to equalizer 522).
(Referring to Fig. 1, Ketchum illustrates using distortion estimates as equalization parameters, see [0038] lines 1-11 & [0034]).

Regarding Claim 9, Ketchum discloses the multiple input multiple output system of claim 7, further comprising a channel estimator to connect to said receivers, said channel estimator to estimate at least one channel characteristic for said channel, **[0112]**

Regarding Claim 10, Ketchum discloses the multiple input multiple output system of claim 7, wherein said crosstalk filtering module comprises:

a channel impulse response matrix generator to generate a channel impulse response matrix, **[0040] (Referring to Fig.1, TX and RX MIMO processors which generate the channel impulse response matrix in the MIMO communication system as illustrated in Fig. 1).**

(Paragraph [0112] discloses that the RX MIMO processor transmits or generates the estimated channel impulse response).

a crosstalk suppression filter matrix generator to generate a crosstalk suppression filter matrix using said channel impulse response matrix; a filter to filter said data streams using said crosstalk suppression filter matrix, **[0034] see lines 1-6.**

Regarding Claim 11, Ketchum discloses an apparatus, comprising:

a plurality of receivers to receive a plurality of data streams transmitted over a communications channel, **[0007] (Fig. 1 and Fig. 3) (Ketchum illustrates a MIMO system in Fig. 3 where section 300 illustrates the plurality of transmitters and receivers connected to communications medium 310).**

a crosstalk filtering module to connect to said plurality of receivers, said crosstalk filtering module to filter said data streams to reduce far end crosstalk noise incurred by

said data streams during said transmission to form filtered data streams, **(Referring to Fig. 1, section 170 illustrates a crosstalk filtering module connecting to the receivers of said MIMO system). [0034] see Lines 1-9).**

said filtered data streams having substantially similar equal impulse responses, **(Referring to Fig. 1, Ketchum illustrates a plurality of data streams by vector r(n) [0031], where r(n) is filtered through filter 172. Ketchum teaches a corresponding equal matched filter for each individual set of plurality data streams which outputs equal impulse responses for each data stream that is filtered, [0040-0043]).**

one or more equalizers to connect to said crosstalk filtering module, said one or more equalizers to equalize said filtered data streams using a set of substantially similar equalization parameters, **(Referring to Fig. 6A and 6B, Ketchum illustrates one or more equalizers where the plurality of data streams r(n) are filtered and equalized and forwarded to decision feedback filter 618 to form recover data streams), [0136].**

(Referring to 5, Ketchum illustrates one or more equalizers where a channel impulse response matrix containing the impulse responses of said data streams is generated from channel estimator 512 and forwarded to equalizer 522).

(Referring to Fig. 1, Ketchum illustrates using distortion estimates as equalization parameters, see [0038] lines 1-11 & [0034]).

Regarding Claim 12, Ketchum discloses the apparatus of claim 11, wherein said crosstalk filtering module comprises:

a channel impulse response matrix generator to generate a channel impulse response matrix, **[0040] (Referring to Fig. 1, TX and RX MIMO processors generate the channel impulse response matrix in the MIMO communication system. Paragraph [0112] discloses that the RX MIMO processor transmits or generates the estimated channel impulse response).**

a crosstalk suppression filter matrix generator to generate a crosstalk suppression filter matrix using said channel impulse response matrix; a filter to filter said data streams using said crosstalk suppression filter matrix, **[0034] see lines 1-6**

Regarding Claim 13, Ketchum discloses the apparatus of claim 11, further comprising a channel estimator to connect to said receivers, said channel estimator to estimate at least one channel characteristic for said channel, **(Referring to Fig. 5, channel estimator 112 is illustrated, [0112] see Lines 1-5).**

Regarding Claim 14, Ketchum discloses apparatus of claim 13, wherein said channel impulse matrix generator is to connect to said channel estimator, and said channel impulse matrix generator is to use said at least one channel characteristic for said

channel to generate said channel impulse matrix, **(the channel estimator sends or generates an estimated channel impulse response matrix, [0112] see lines 1-5).**

Regarding Claim 15, Ketchum discloses an article of manufacture comprising:

a storage medium;

said storage medium including stored instructions that, when executed by a processor,

result in estimating a channel impulse response matrix, **see lines 1-5 of [0080] & [0081].**

creating a crosstalk suppression filter matrix based on said channel impulse response matrix, **[0007] see Lines 3-11, (Fig. 1 illustrates the impulse response for the received symbol vector r(n) wherein a noise vector Z(n) which is processed at the receiver, and is transmitted through a suppression filter 170).**

filtering a plurality of data streams received over a channel for a multiple input multiple output system to reduce far end cross talk between said data streams using said crosstalk suppression filter matrix (**see Fig. 1 item 170**) to form filtered data streams, **[0007] Lines 13-18.**

said filtered data streams having substantially similar equal impulse responses, **(Referring to Fig. 1, Ketchum illustrates a plurality of data streams by vector r(n) [0031], where r(n) is filtered through filter 172. Ketchum teaches a corresponding**

equal matched filter for each individual set of plurality data streams which outputs equal impulse responses for each data stream that is filtered, [0040-0043]).

equalizing said filtered data streams **([0007] see lines 7-15),** using a set of substantially similar equalization parameters, **(Referring to Fig. 6A and 6B,Ketchum illustrates one or more equalizers where the plurality of data streams r(n) are filtered and equalized and forwarded to decision feedback filter 618 to form recover data streams), [0136]).**
(Referring to 5, Ketchum illustrates one or more equalizers where a channel impulse response matrix containing the impulse responses of said data streams is generated from channel estimator 512 and forwarded to equalizer 522).
(Referring to Fig. 1, Ketchum illustrates using distortion estimates as equalization parameters, see [0038] lines 1-11 & [0034]).

Regarding Claim 16, Ketchum discloses the article of claim 15, wherein the stored instructions, when executed by a processor, further result in said estimating by estimating at least one channel characteristic for said channel, **[0007] see Lines 1-7 (Interpretation of the claim language with respect to applicant's specification shows the signals are predetermined for the response values at the receiving end. Ketchum discloses that a number of received signals or "response values"**

are preconditioned based on an estimated response of the MIMO channel which in return forms a channel impulse response matrix).

(The signals communicated between the transmitter and receiver over the channel once the characteristic is measured, are shown to be predetermined by Ketchum, [0030]).

approximating a plurality of channel impulse response values based on said channel characteristic, and creating said channel impulse response matrix using said channel impulse response values, **[0020-0022].**

Regarding Claim 17, Ketchum discloses the article of claim 15, wherein the stored instructions, when executed by a processor, further result in said creating by transposing said channel impulse response matrix, **[0042].**

substituting each element of said transposed channel impulse response matrix with its minor element, **[0114]**, **(Substituting each element of said CIR matrix with its minor element is interpreted as convolution in the claim with respect to the applicant's specification).**
(The paragraph illustrates convolution being performed on said transposed channel impulse response matrix).

determining a sign for each minor element, **[0126] [0127 see lines 1-5]. (Determining a sign for each minor element is interpreted as convolution values in the claim with respect to the applicant's specifications. The paragraphs cited, determine the order for the convolution values or "minor element" based on the values sign).**

Conclusion

4. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ADNAN BAIG whose telephone number is (571) 270-7511. The examiner can normally be reached on Mon-Fri 7:30m-5:00pm eastern Every other Fri off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Huy Vu can be reached on 571-272-3155. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/ADNAN BAIG/
Examiner, Art Unit 2416

/Huy D. Vu/

Supervisory Patent Examiner, Art Unit 2416